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ABSTRACT

The purpose of this paper is to consider the concept of "relative age" and to review recent research findings that have demonstrated that relative age is related to a variety of academic and athletic performance measures. The paper is divided into six parts: (1) the relative age concept; (2) relative age and achievement in sports; (3) relative age and achievement in school; (4) relative age or readiness; (5) relative age, hockey, and education; and (6) "neutralizing" the relative age effect in schools. Appended are 14 references. (SI)

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# BIRTHDATE AND PERFORMANCE: THE RELATIVE AGE EFFECT

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by

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The purpose of this paper is to consider the concept of "relative age" and to review recent research findings which have demonstrated that relative age is related to a variety of academic and athletic performance measures.

A. THE RELATIVE AGE CONCEPT. The concept of relative age is based upon the observation that whenever children are grouped by age for any activity, be it school or recreational sports, the children within each group may differ in age (relative age) by an amount up to the time span of the group. Thus, if children attending grade one are comprised of children born in the period from September of one year to August of the next year, then the children born in September will possess a one year relative age advantage over the children born in August of the following year. Conversely, the children born in the month of August have approximately a one year age disadvantage relative to their September born peers.

B. RELATIVE AGE AND ACHIEVEMENT IN SPORTS. (NOTE: The text of this section is made up largely of quotes from the Barnsley and Thompson (1988) paper.)

1. Relative Age and Success in Professional Hockey. Barnsley, Thompson and Barnsley (1985) have demonstrated that success in hockey, as demonstrated by playing in the National Hockey League and two of its major developmental "feeder" leagues, bears an extremely strong relationship to the month of birth. Table 1 depicts the months of birth of National Hockey League players.

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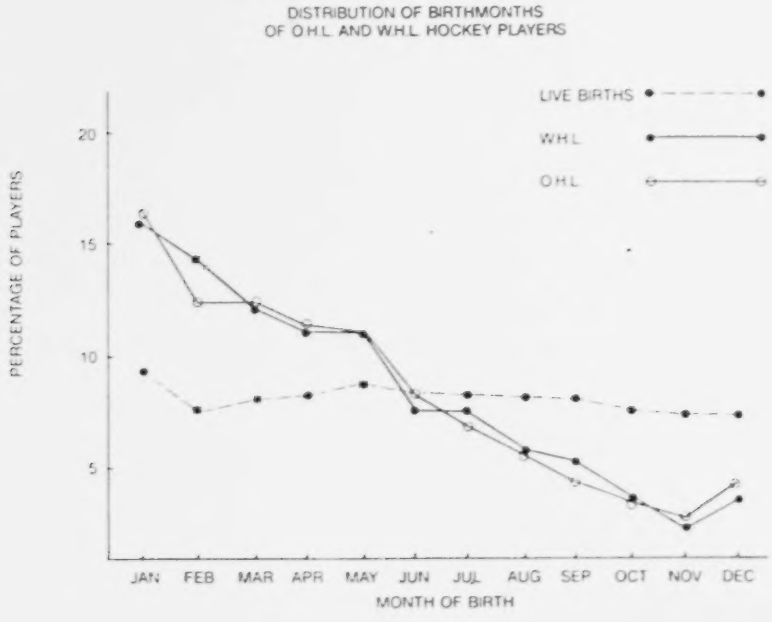
Table 1
(from Barnsley, Thompson and Barnsley, 1985)

MONTHS OF BIRTH
NATIONAL HOCKEY LEAGUE PLAYERS
1982/83 SEASON

| | PERCENTAGES | | | NUMBERS | |
|---|---|---|---|---|---|
| 61.8% | 32.0% | 11.3% | January 81 | | |
| | | 9.7% | February 69 | 229 | |
| | | 11.0% | March 79 | | 442 |
| | 29.8% | 10.1% | April 72 | | |
| | | 10.9% | May 78 | 213 | |
| | | 8.8% | June 63 | | 715 |
| 38.2% | 21.9% | 6.4% | July 46 | | |
| | | 6.3% | August 45 | 157 | |
| | | 9.2% | September 66 | | 273 |
| | 16.2% | 5.3% | October 38 | | |
| | | 6.3% | November 45 | 116 | |
| | | 4.6% | December 33 | | |

Figure 1 shows, in graphical form, the distribution of birthmonths of Ontario and Western Hockey League players.

Figure 1
(from Barnsley, Thompson and Barnsley, 1985)



2. Factors Underlying Relative Age and Success in Hockey. One explanation that may be offered to account for the relationship between month of birth and hockey success resides in a proposed shift in participation rates in minor hockey programs for children born in different months. Therefore, it would be hypothesized that as the group of children in minor hockey gets older, those born in the first months of the year tend to remain as participants, whereas those born in the later months of the year tend to drop out.

This explanation is based on the fact that when children are age grouped, the older children in the age group have a developmental advantage over the younger children in the same age grouping. As a result, when these children play hockey together, the older children (January, February, March birthdates), who are generally bigger, stronger, and better coordinated than the younger children (October, November, December birthdates), do much better. By doing better, these older children achieve more success, receive greater rewards for their endeavours and thus are more likely to remain in minor hockey for a number of years.

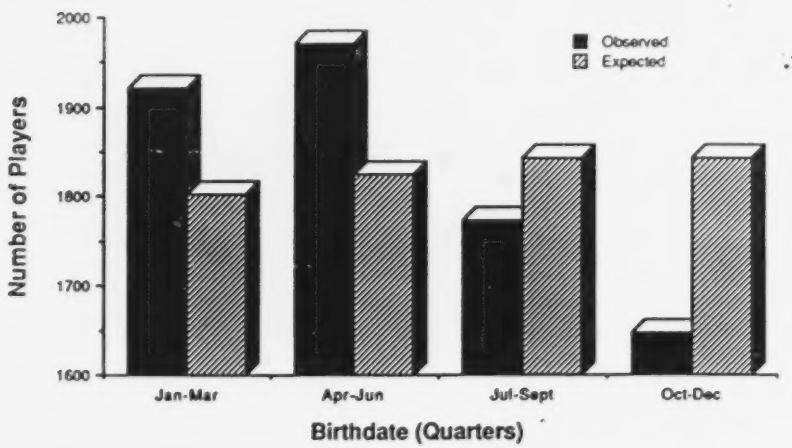
On the other hand, a complementary process is working against the younger players in their age grouping. As these children experience a developmental disadvantage in relation to their older playing mates, they are more likely to experience frustration and failure and, as a result, develop a lower expectation for themselves as hockey players. This analysis suggests that as a result of their negative experiences the younger children may tend to leave hockey for other recreational activities in which they are more likely to achieve success. Therefore, players born in the early months of the year would represent a larger pool of players than would be found in the later months.

A second explanation that has been suggested to account for the relationship between month of birth and long-term success in hockey resides in the differential hockey experiences given to players who are chosen for "rep" teams (generally "representative" of a city or an area) or top "tier" teams in their leagues. The reasoning in this argument is that the young hockey players who have a relative age advantage (born in January, February, March) are more likely to be picked for the higher calibre teams than are those players who have a relative age disadvantage (born in October, November, December). Then, these higher calibre teams offer young hockey talent such advantages as better coaching, higher level competition, more ice time,

greater prestige, and so forth. As a result, the future N.H.L. players tend to evolve from the "rep" system and therefore, it is hypothesized that the players chosen for the "rep" system will represent a larger number of players with a relative age advantage.

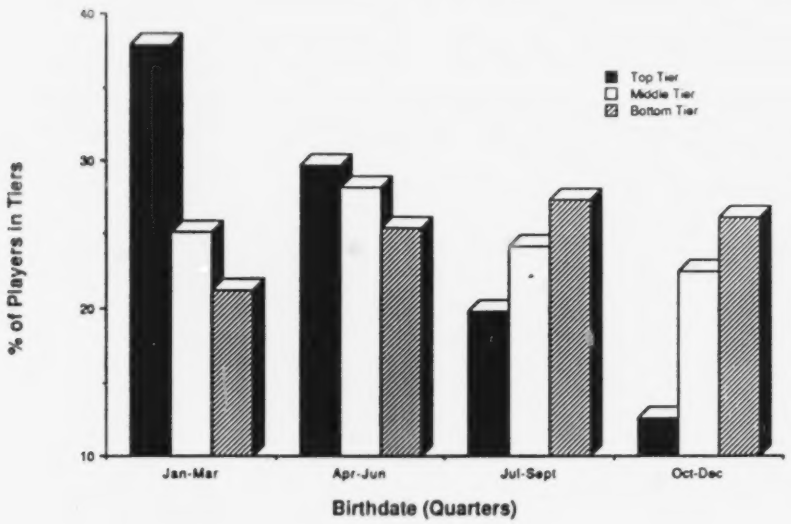
3. **Relative Age and Success in Minor Hockey.** In order to understand the "birthdate effect" observed in older hockey leagues, Barnsley and Thompson (1988) examined the effects of relative age in children's or, minor hockey leagues. In this study, two correlates of relative age were observed. First, participation rates of minor hockey league players have been shown to be related to relative age. Figure 2 demonstrates this relationship.

**Figure 2**
Birthdate and Participation Rate in Minor Hockey
(from Barnsley and Thompson, 1988)




Secondly, relative age has been shown to be related to the success that young hockey players experience while playing in Minor Hockey Leagues. In this study, the results of which are depicted in Figure 3, success was defined by the calibre of the league in which the player was participating.

Figure 3
Relationship between Birthdates and Hockey Tier
(from Barnsley and Thompson, 1988)




Barnsley and Thompson (1988) have argued that these data explain the findings of Barnsley, Thompson, and Barnsley (1985) with respect to the birth months of O.H.L., W.H.L., and N.H.L. players.

4. Relative Age and Success in Other Professional Sports. In relation to these findings, it is interesting to consider whether the observed relative age effect in hockey is evident in other areas of sports endeavour. Recently, Daniel and Janssen (1987) looked for relative age effects in professional football, basketball and baseball and, having found none, conclude that these findings "...lend support to the theory that the relative age effect is a product of the present Canadian minor hockey system..." (Daniel and Janssen, 1987, p. 23). Further, Daniel and Janssen (1987) assert that the underlying factor is the early age at which minor hockey, in comparison to other youth sports programs, begins highly competitive programs which "tier" players or, select "rep" teams.

C. RELATIVE AGE AND ACHIEVEMENT IN SCHOOL. A number of recent published articles have considered the relationship between the relative age of children and their academic success in school. In addition, Barnsley (unpublished) obtained a variety of data on this topic from Lethbridge School District No. 51 where he was previously employed. Findings from these two sources are reported below.

1. Relative Age and Success in the First Grade. Lethbridge School District No. 51 routinely carried out a screening of all grade one students in the Autumn of each year. On the basis of these tests, a number of children were designated "high risk" with respect to achieving success in Grade One. The relation of "high risk" children to their month of birth is seen in Table 2.

Table 2
First Grade Screening Test

| Students Birthdate | Number of Students | Percentage Experiencing Difficulty |
|---|---|---|
| Before Sept. 1977 | 10 | 7.0 % |
| October 1977 | 1 | .71% |
| November 1977 | 1 | .71% |
| December 1977 | 2 | 1.42% |
| January 1978 | 3 | 2.13% |
| February 1978 | 4 | 2.84% |
| March 1978 | 4 | 2.84% |
| April 1978 | 3 | 2.13% |
| May 1978 | 4 | 2.84% |
| June 1978 | 9 | 6.37% |
| July 1978 | 9 | 6.37% |
| August 1978 | 10 | 7.08% |
| September 1978 | 14 | 9.91% |
| October 1978 | 5 | 3.54% |
| November 1978 | 13 | 9.2 % |
| December 1978 | 11 | 7.79% |

Data were also collected from Lethbridge School District No. 51 which related the number of children retained in Grade One for another year with their month of birth. These data, which are reported in Table 3, are consistent with the findings of Beattie (1970) and Davis, Trimble, and Vincent (1980) who observed that the younger children entering Grade 1 achieve significantly less than their older classmates.

Table 3
Summary of Grade One Retentions

| BIRTHDATES | NUMBER OF BOYS | NUMBER OF GIRLS | PERCENTAGE TOTALS |
|---|---|---|---|
| January | | | |
| February | | | 4% |
| March | | 2 | 4% |
| April | 3 | 1 | 8% |
| May | 1 | 0 | 2% 24% 28% |
| June | 5 | 2 | 14% |
| July | 3 | 2 | 10% |
| August | 3 | 2 | 10% 31% |
| September | 4 | 2 | 12% |
| October | 3 | 2 | 10% |
| November | 6 | 4 | 20% 41% 72% |
| December | 4 | 2 | 12% |
| | 32 | 19 | 100% |

2. **Relative Age and Academic Achievement.** Kalk, Langer, and Searls (1982) found that the effects of entrance age could still be observed in the educational achievement of thirteen year olds. In order to more systematically explore this finding, Barnsley analyzed system wide data on the Canadian Achievement Test which were obtained from Lethbridge School District No. 51. Two results from two representative grades, three and nine, are reported below in Tables 4 and 5.

Table 4
Grade Three--National Percentiles

| BIRTHDATE | NO. | READING | SPELLING | LANG. | MATH | TOTAL |
|---|---|---|---|---|---|---|
| 1975 | 87 | | | | | |
| 75.01 - 75.04 | 16 | 28.7 | 35.4 | 29.0 | 38.2 | 29.5 |
| 75.05 - 75.08 | 25 | 26.2 | 26.1 | 29.3 | 29.2 | 25.5 |
| 75.09 - 75.12 | 46 | 35.8 | 30.5 | 41.8 | 35.8 | 34.4 |
| 1976 | 456 | | | | | |
| 76.01 - 76.04 | 166 | 55.1 | 52.1 | 58.0 | 51.1 | 54.0 |
| 76.05 - 76.08 | 167 | 51.7 | 49.7 | 52.2 | 48.9 | 50.5 |
| 76.09 - 76.12 | 123 | 48.8 | 49.4 | 52.7 | 40.5 | 46.6 |

Table 5
Grade Nine--National Percentiles

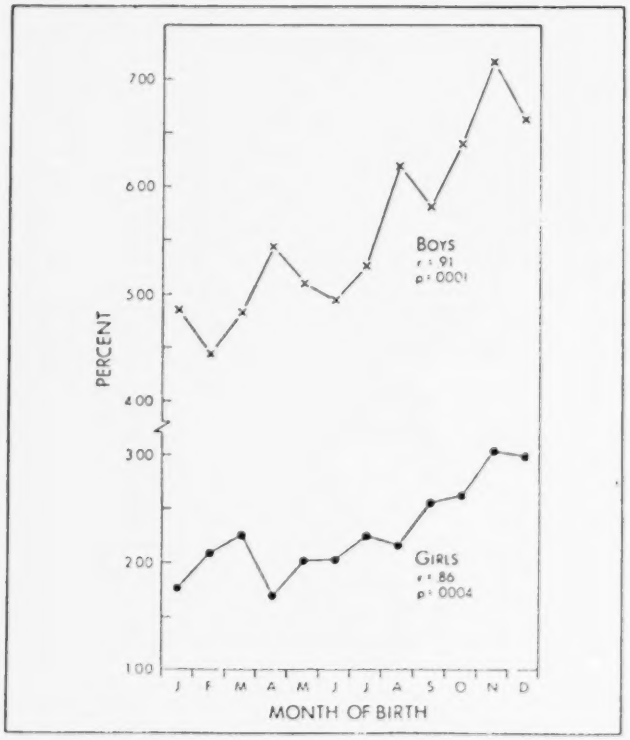
| BIRTHDATE | NO. | READING | SPELLING | LANG. | MATH | TOTAL |
|---|---|---|---|---|---|---|
| 1969 | 104 | | | | | |
| 69.01 - 69.04 | 19 | 21.8 | 35.0 | 20.1 | 21.1 | 17.9 |
| 69.05 - 69.08 | 37 | 27.9 | 23.8 | 22.8 | 21.1 | 19.4 |
| 69.09 - 69.12 | 48 | 39.7 | 40.1 | 37.4 | 29.6 | 32.9 |
| 1970 | 456 | | | | | |
| 70.01 - 70.04 | 133 | 59.4 | 51.2 | 58.0 | 51.6 | 56.4 |
| 70.05 - 70.08 | 171 | 57.6 | 54.0 | 53.2 | 47.0 | 52.0 |
| 70.09 - 70.12 | 152 | 63.2 | 56.3 | 59.3 | 52.9 | 59.4 |

It is interesting to note that relative age effects have been shown to be related to academic achievement in a sample of university students. Russell and Startup (1985) reported that, "...people who are relatively old on entry to

university still seem to be at an education advantage: a disproportionate number of them graduate." (Russel and Startup, 1985, p. 844). Clearly, the effect of relative age on academic achievement continues throughout the entire educational experience.

**3. Relative Age and Special Education Placements.** Research has shown that the age of entry to school is related to the incidence within some classifications of exceptional children. Diamond (1983) and Maddux (1980) both found that children with relative age disadvantages were over represented in programs for children with learning disabilities. Figure 4 shows the data that was presented by Diamond (1983) in order to demonstrate this point.

**Figure 4**
Percentage of Children Born in Each Month Classified as SLD
(from Diamond, 1983)



Interestingly, a report by Maddux, Stacy and Scott (1981) has shown that children who possess a relative age advantage are over represented as a group in programs for gifted children. In Table 6, the data reported by Maddux, Stacy and Scott (1981) may be found.

Table 6
Early and Late Entering Gifted Children
(from Maddux, Stacy and Scott, 1981)

| EARLY | | LATE | |
|---|---|---|---|
| N | % | N | % |
| 74 | 39.36 | 114 | 60.64 |

D. RELATIVE AGE OR READINESS? The preceding data have clearly shown that month of birth is related to success at school as measured by academic achievement and placement in special education programs. In this paper these findings have been discussed in terms of relative age advantage or disadvantage. As could be predicted, the explanation of relative age is not universally accepted. Indeed, several authors (e.g. Uphoff and Gilmore, 1985; and Frick, 1986) have argued that these results are best interpreted in the context of a child's "lack of readiness" to attend school. Simply put, the "readiness" hypothesis suggests that if children are not "ready" to attend school when they begin Grade 1, they will, as a group, experience above average levels of problems and failure.

The main argument for accepting the relative age hypothesis over the readiness position lies in a comparison of the Uphoff and Gilmore (1985) and Barnsley data. In the Uphoff and Gilmore paper, it was shown that the children that have difficulty in school are the "summer" babies--i.e. those children that are born in June, July and August. However, it can be seen from the data presented earlier in this paper from Lethbridge School District No. 51, that the children that have difficulty are the "autumn" babies. These differences are the result of differing cutoff dates in the year for students beginning school. Logically, if "readiness", or maturation was the main determining factor, both the "Summer" babies and the "Autumn" babies ought to

experience difficulty in Lethbridge School District No. 51. However, such is not the case as it is only the younger children, i.e., those with a relative age disadvantage (September through December birthdates), who are shown to be at risk. Consequently, it appears that an interpretation of the data based upon relative age offers the more parsimonious and valid explanation.

Before considering how these two different hypotheses affect may affect educational decisions, a short explanation of why relative age is related to achievement is in order. Clearly, relative age advantage is related to developmental advantage, and developmental advantage or chronological age is directly related to a host of achievement variables. Thus, the older children in any group will on the average always perform better than their younger counterparts. In addition, it is also argued that the older children in a group (relative age advantage) will also be the beneficiaries of higher teacher expectations (Rosenthal and Jacobson, 1968) and thus, strive to meet these higher goals. Further, as a result of relative age advantage, older children frequently are exposed to a differentiated curricula designed to challenge them. This differentiation of the older children's program in turn enhances their achievement and success beyond that of their younger classmates. In summary then, for the older children in a group "success breeds success", and the higher expectations of their teachers spurs them on to greater performance. As a result, children with relative age advantages realize higher achievement in both the short and long term than their peers with a relative age disadvantage.

The crux of the issue is, however, that many educators believe that they can make achievement more equitable for all children, regardless of month of birth, by paying greater attention to matters related to "readiness". Thus, actions such as changing the cutoff date for school entry so that the children are older before entering school and altering the curriculum to provide for the younger children have been suggested. These are all thoughtful and reasonable suggestions, provided that the explanation for the data lies within the concept of "readiness". If, however, the data under discussion are more appropriately accounted for under the relative age hypothesis, then these proposed solutions will have little effect, as they fail to alter in any way the relative age advantages or disadvantages of the children entering school. This is

unfortunate, as it would seem that it will be much more difficult for educators to offer solutions that will neutralize the effects of relative age.

E. RELATIVE AGE, HOCKEY AND EDUCATION. It may not seem particularly important or relevant to have included the data on hockey success and relative age in a paper primarily directed to educators. However, the hockey data were included for two reasons. The first, is that it is apparent from the hockey studies that the relative age hypothesis has generality beyond education. Therefore, relative age should be considered as a potentially useful concept by all professionals concerned with the lives of young children.

Secondly, it is argued that the hockey results provide educators with an appropriately analagous model which serves to "flag" a very serious problem. As was shown in Barnsley and Thompson (1988) decisions made about young children that were highly related to relative age produced the long term effects previously described by Barnsley, Thompson, and Barnsley (1985). Specificially, the grouping or streaming of children into hockey leagues of different calibre was shown to be highly sensitive to the relative age of the children and further, these streaming decisions had the effect of developing a larger number of children with a relative age advantage to a professional level of hockey skills in later life.

It appears, that a parallel situation is evident in education. Specifically, educational achievement, streaming and special education placements are related to the relative age of children. Given that common correlates of such educational classifications are frequently differentiated curricula, rewards, success and expectations, it is predictable that in the future there will be an over representation of students with relative age advantages populating universities and the more desirable professions. It is suggested that in this egalitarian society such an outcome is not acceptable and therefore, educators must seek ways by which educational opportunity is equitably distributed for all children, regardless of their month of birth.

F. "NEUTRALIZING" THE RELATIVE AGE EFFECT IN SCHOOLS.

Given the role that relative age differences appear to be playing in schools, the question is raised as to what could be done to reduce or eliminate its effect. In considering this issue, three possible groups of proposals emerge that could reduce the observed relationships with month of birth. First, it is suggested that bringing these data to the attention of educators may create an awareness and sensitivity to the problem, which in itself, may lead to a reduction of the relative age effect.

A second set of proposals are based on the assumption that as educational achievement is related to relative age, then manipulations of relative age could be used to alter the phenomenon. An obvious way to achieve this would be to have several entry points or dates in the school year for beginning formal instruction. Such a solution would clearly reduce the range of the age grouping and thereby reduce the difference in relative age of the students in the group. However, this solution would create extremely difficult timetabling and scheduling problems both in the present and future grade placements.

A third set of proposals consider the possibility of restructuring learning environments in order to reduce the need for measuring achievement and, the subsequent classification and streaming of children. In the context of this suggestion, educators would again look to such matters as ungraded classrooms, continuous progress, and individualization of instruction. Clearly, although these ideas have considerable support in the teaching profession, the time and money necessary for their successful implementation has never been made available to educators.

In conclusion, it appears that an acceptance of the relative age hypothesis leads to a complex educational problem without an apparent practical or manageable solution. Regardless of this pessimistic position, the problem is extremely important and demands educators' attention. Clearly, in this society, it is intolerable to think of a factor such as the month of birth being a significant variable in the achievement of success in one's life.

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